THE NEED FOR TRAINING FOR UNCERTAINTY

A MONOGRAPH
BY
Major Brian D. Prosser
Infantry

School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas

First Term AY 96-97

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	18 December 1996	Monograph, 24 June - 18 December 96

4. TITLE AND SUBTITLE

The Need For Training For Uncertainty

5. FUNDING NUMBERS

6. AUTHOR(S)

Major Brian D. Prosser, U.S. Army

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

SCHOOL OF ADVANCED MILITARY STUDIES
ATTN: ATZL-SWV
Fort Leavenworth, Kansas 66027-6900
COM (913) 684-3437 AUTOVON 552-3437

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Distribution statement A

"Approved for public release; distribution is unlimited."

12b. DISTRIBUTION CODE

"A"

13. ABSTRACT (Maximum 200 words)

The battlefield's rapidly changing environment requires soldiers to make decisions and use initiative to defeat the enemy. This monograph's intent is to explain why training for uncertainty is imperative in cultivating a unit able to adapt to the changing conditions in combat. The primary research question is: How does training for uncertainty enhance a soldier's ability to display initiative on the battlefield?

This monograph explains complexity theory and then relates the theory's applications to the battlefield. The author discusses the requirements for a complex, adaptive system and how a system adapts to changing conditions to remain viable in its environment. Emergent behaviors within the system enable the whole system to adapt and survive. However, this emergence can retard the growth of a system if no overarching goal or unifying concept is present.

On the battlefield, this unifying concept is the commander's intent and the emergent property is initiative. Only by knowing the commander's overall purpose can soldiers make judgments which further the goals of the commander and the unit. However, soldiers cannot be expected to employ initiative on the battlefield if they have not been required to practice it in training. Training for uncertainty will produce soldiers better able to apply initiative on the battlefield.

14. SUBJECT TERMS			15. NUMBER OF PAGES
			58
16. PRICE CODE			
17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Unclassified

ABSTRACT

THE NEED FOR TRAINING FOR UNCERTAINTY by MAJ Brian D. Prosser, USA, 58 pages.

The battlefield's rapidly changing environment requires soldiers to make decisions and use initiative to defeat the enemy. This monograph's intent is to explain why training for uncertainty is imperative in cultivating a unit able to adapt to the changing conditions in combat. The primary research question is: How does training for uncertainty enhance a soldier's ability to display initiative on the battlefield?

This monograph explains complexity theory and then relates the theory's applications to the battlefield. The author discusses the requirements for a complex, adaptive system and how a system adapts to changing conditions to remain viable in its environment. Emergent behaviors within the system enable the whole system to adapt and survive. However, this emergence can retard the growth of a system if no overarching goal or unifying concept is present.

On the battlefield, this unifying concept is the commander's intent and the emergent property is initiative. Only by knowing the commander's overall purpose can soldiers make judgments which further the goals of the commander and the unit. However, soldiers cannot be expected to employ initiative on the battlefield if they have not been required to practice it in training. Training for uncertainty will produce soldiers better able to apply initiative on the battlefield.

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

Major Brian D. Prosser

Title of Monograph: The Need For Training for Uncertainty

Approved by:

James J. Schneider, Ph.D. — Monograph Director

COL Danny M. Davis, MA, MMAS — Director, School of Advanced Military Studies

Philip J. Brookes, Ph.D. — Director, Graduate Degree Program

Accepted this 20th Day of December 1996

ABSTRACT

THE NEED FOR TRAINING FOR UNCERTAINTY by MAJ Brian D. Prosser, USA, 58 pages.

The battlefield's rapidly changing environment requires soldiers to make decisions and use initiative to defeat the enemy. This monograph's intent is to explain why training for uncertainty is imperative in cultivating a unit able to adapt to the changing conditions in combat. The primary research question is: How does training for uncertainty enhance a soldier's ability to display initiative on the battlefield?

This monograph explains complexity theory and then relates the theory's applications to the battlefield. The author discusses the requirements for a complex, adaptive system and how a system adapts to changing conditions to remain viable in its environment. Emergent behaviors within the system enable the whole system to adapt and survive. However, this emergence can retard the growth of a system if no overarching goal or unifying concept is present.

On the battlefield, this unifying concept is the commander's intent and the emergent property is initiative. Only by knowing the commander's overall purpose can soldiers make judgments which further the goals of the commander and the unit. However, soldiers cannot be expected to employ initiative on the battlefield if they have not been required to practice it in training. Training for uncertainty will produce soldiers better able to apply initiative on the battlefield.

Table of Contents Page

I. Introduction

The battlefield is a confusing mess. Friction, fog, chance and danger all cultivate uncertainty in a combat environment. Through the centuries of warfighting, armies have tried different methods to combat the uncertainty inherent when human wills oppose each other in a life and death struggle. Frederick the Great once remarked that, "If my men began to think, not one would remain in the ranks."[1] For most armies, this view of soldiers as interchangeable parts coming off of an assembly line has changed dramatically.[2] Commanders realize that the soldier's ability to effect the battle have increased radically due to considerations such as span of control, speed of operations and the rapid increase of information present on the battlefield. The battlefield's rapidly changing environment requires leaders and soldiers at all levels to make decisions and use initiative to defeat the enemy.

The U.S. Army's warfighting doctrine, FM 100-5, emphasizes the need for initiative on the battlefield. The doctrine writers recognize that new technologies and weapon systems by themselves cannot overcome or control the confusion of the battlefield.[3] Commanders and soldiers alike must utilize sound judgment with a willingness to act in order to properly employ men and machines under the worst circumstances.

However, soldiers cannot be expected to employ initiative on the battlefield if they have not been required to practice it in training situations. The intent of this monograph is to explain why training for uncertainty is imperative in cultivating a unit able to adapt and react to the changing conditions in combat. The primary research

question to be answered is: How does training for uncertainty enhance a soldier's ability to display initiative on the battlefield? In concert with this question are four subordinate research questions. First, what is complexity and how does it relate to combat? This section will discuss complexity theory and relate its application to the battlefield. Second, within the framework of a complex environment, what part does commander's intent play in displaying initiative on the battlefield? This question will explore how and why initiative is an integral part of unit's ability to adapt to changing conditions. Third, how do discipline, will and judgment affect a unit's ability to employ initiative? This section will explain the importance that discipline, will and judgment play in a soldier's ability to know when to employ initiative. Fourth, does current U.S. Army training doctrine incorporate and emphasize the need for training for uncertainty? This question will discuss the utility of the task, condition and standard training format and its effect on training soldiers for uncertainty. Last, how can training better prepare leaders and soldiers to display initiative on the future battlefield? This section will give recommendations for better preparing units for the confusion present in combat.

The intended audience for this research are tactical leaders responsible for training units and soldiers for combat. The focus is on brigade units and lower; the examples used in this monograph refer to infantry units. The intent is to provide impetus to these leaders to take a hard look at their training to determine whether, in fact, their program is requiring soldiers to use judgment and display initiative to accomplish successfully their missions.

II. Complexity Explained

Living organisms are too complicated to describe quantitatively. Human interactions cannot be described simply through mechanistic terms and cause and effect relationships. Complexity scientists understand this; they recognize that human actions are filled with change, disorder and uncertainty. Complexity theory is used as a vehicle in this study to understand these dynamic processes. The theory's importance is that it aids us in significantly improving our understanding of the human phenomena.

The science of complexity is relatively new, with the main impetus for its study and research coming in the early eighties. Until then, the vast majority of scientific study was based on the Newtonian view. This view rests on mechanistic underpinnings which look at systems as only the sum of their individual parts. Scientists believed that by looking at each of the individual parts in a system, they could then explain and even predict future events by merely arranging and rearranging individual parts in the system. By reducing these systems into models, scientists attempted to show that systems were deterministic, linear and predictable to an observer. The results, in some cases, were also reassuring because scientists could claim that they could predict the future due to the sequential change seemingly inherent in their models.[4]

Consider a lab experiment done in high school chemistry. A student isolates an element in an experiment to determine how that element reacts when mixed with another. The student determines the results for this experiment. He describes the processes and results. If the student repeats the experiment again and again, he will get the same results.

Although simplistic, this experiment represents the basis of Newtonian science. Scientists control the experiment by including only certain elements. Scientists isolate certain variables in a system to determine a "cause and effect" relationship between them. This "cause and effect" is a crucial piece, because only then can science:

> develop generalities that allow people to describe the regularities of nature and therefore enable them to predict the effects of their behavior. Science develops laws and grand theories that organize these generalizations into neat bundles that create certainty and predictability in the universe.[5]

By discovering the order and regularities contained in the world, science can then gain a greater understanding of man's surroundings and create a world of greater predictability.

However, the predictability that Newtonian science produces is dependent on a system's linearity. For a system to be linear, it must meet two conditions. First, the system must be proportional, meaning that changes in the output are proportional to changes in the input. Think of a baseball pitcher - the more force he uses to throw a baseball, the faster the ball will travel. Second, the system must have an additive property. This simply means that the system as a whole is equal to the sum of its parts.[6] In essence Newtonian scientists make predictions by dissecting a system down to its individual variables, learn about each variable's characteristics and then use the additive property to determine effects on the system as each variable is added back into the system. Scientists can then gauge the effect of outside influences by referring to the proportionality property. It is a fairly neat and simple process, with orderly answers and seemingly reliable predictions. But problems with this approach became apparent.

> Newtonian science ignored nonlinear phenomena that did not behave in a predictable manner. It pushed them under the carpet and tried to deal only with the regular linear aspects of reality. When nonlinear phenomena poked

> their heads into scientific findings they were treated as approximate linearities. Otherwise they were seen as strange features of reality that would one day be explained as scientific knowledge advanced.[7]

This is not to say that Newtonian science does not explain much of nature, but complexity theorists believe that alongside these explanations lies an even richer world where scientists must look beyond simple "cause and effect" relationships.

The theory of complexity requires a new way of thinking. Instead of a reductionist view where the system is split up into its separate parts for examination, complexity theory takes a holistic view of a system and demands that it be viewed in its entirety. Complexity theorists decry the amount of emphasis that Newtonian scientists place on identifying the actions of individual variables. A complex, adaptive system cannot be described by putting its separate pieces together.

> Complexity demands analysis at the macroscopic, rather than the microscopic, scale because it is a consequence of interactions between many units whose properties in isolation tell us virtually nothing about important global behavior.[8]

The main focus of complexity theory is the entire system. Complexity scientists place importance on individual variables only as they affect the whole system.

So what is complexity and what is required for a complex, adaptive system to be present? Peter Coveney defines complexity as, "the study of the behavior of macroscopic collections of such units that are endowed with the potential to evolve in time."[9] Stephen Wolfram of the Institute for Advanced Study looks at complexity on an even more fundamental level, believing that, "The complexity is actually in the organization --- the myriad possible ways that the components of the system can interact."[10]

Two requirements must be present to enable a complex system to adapt to its environment. First, the system is sensitive to initial conditions. In order to predict what a system will do in the future, scientists must take exacting measurements. In a laboratory isolating only a couple of variables, this may be possible. But outside of the lab, exact measurements are difficult if not impossible to attain. In the economy, how do you get an exact measurement of the relative worth of one product versus a similar product? How do you quantify the exact thought processes that a person uses when he buys a car? Complexity scientists acknowledge that these measurements can be nearly exact, so prediction in the short term is possible. But as time goes on, the prediction loses its value. Think of the value of a weather forecast for the next three days versus the reduced value of a forecast for the next ten days.

> Only if an observer knew with infinite accuracy what the starting conditions were would he be able to make a cast-iron prediction. But the slightest uncertainty --- always the case in the real world --- denies this, since no matter how small the imprecision, it will be amplified exponentially as time passes.[11]

In order to understand how time will amplify the imprecision, think of balls on a billiard table. A player lines up the ten balls in a straight line approximately three or four inches apart. He places the cue ball in line and is ready to make his shot. He wants to hit the first ball in the exact spot to put the tenth ball in the far left pocket. The player makes the shot and hits the first ball just a millimeter away from the "spot." The balls are curved, however, so very small differences in the initial hit on ball one will amplify as balls two, three, four, etc., collide with the next ball in the path. Because of the player's inability to measure exactly where the cue ball hit the first ball, his ability to predict the effects on the tenth ball is limited.[12]

The billiards example relates directly to the second requirement for a complex, adaptive system: nonlinearity. Proportionality and additivity are no longer valid properties in this system. Small, seemingly unimportant, differences in an input can lead to vastly different outcomes. Therefore a very small variance in hitting the first ball can produce completely different results for the tenth ball. And the system's output can be much more than just the sum of the inputs from its individual parts. The interdependence of the variables with each other affect each of those variables and their effect on the system. In a grander sense the system does not specifically rely on its individual parts, but on the interrelationships between the individual variables which gives the system its wholeness.

Nonlinearity leads to one of the most important characteristics of a complex, adaptive system: feedback. The system can adapt its behavior because of its ability to form and change strategies to continue to survive in its environment. The system uses feedback to anticipate the future and make appropriate changes to remain viable with changing conditions. This is the reason why adaptation in a system is critical - it allows the system to learn through feedback and react appropriately to maintain its significance in the world.

Adaptation gives flexibility to the system but just as important is the system's ability to "regulate this process in such a way that the integrity of their structure is maintained."[13] Every system attempts to survive; without its basic structure maintained, its ability to survive is diminished.

> The evolutionary principle of self-organization embodies two key ideas: the idea of a consistent identity and the idea of dynamic variations essential for its continuous viability. These two aspects of systemic behavior are entirely

> compatible, expressing the facts that notions of stability and adaptive behavior revolve around maintaining a balance between constancy and steady state on the one hand and between change and variability and reorganization on the other.[14]

This self-organization is inherent in every living organism - the need to keep its identity while changing to keep pace with changes in its environment. This need for self-organization enables emergent properties within the system to form new strategies in order to survive in the environment. It is important to realize that this ability to adapt is not caused by individual properties acting unilaterally. A component changes its behavior and effects change in the system only through participating in and interacting with the other components in the system.

> The emergence of a new whole cannot be predicted on the basis of attributes of its components or their separate histories...They do things and display qualities as members of a whole they did not do or possess independently. Each component regulates the behavior of the others, and the whole regulates the behavior of all.[15]

The whole system regulating the behavior of the individual components and their interactions is yet another vital part of a complex system. The system's ability to emphasize the goals of the overall system at the expense of its individual parts captures the essence of a holistic being. Emergent properties within a system can retard that system's ability to adapt to its surroundings if no overarching goal or unifying concept is present. Individual components contained in a system which act in their own self-interest can pull the system apart, ripping apart its structure and taking away the stability required for the system to endure.

Complex, adaptive systems, in short, need a unifying concept to survive. Complexity theory expresses this holistic vision in terms of fractals and attractors. A

fractal is, "a geometric form with fine structure on all scales of magnification,"[16] a structure the organization of which looks the same no matter what level is viewed. Think of the difference between a photograph and a hologram. Tear off a corner of the photograph and look at it. Only a portion of the original photo is seen on the corner piece. In tearing the corner piece from the photograph, we fragment the original image. We cannot reconstruct the whole image from merely the corner of the photograph. Now tear a corner piece off of a hologram and look at it. Instead of seeing just a portion of the image, the whole image is included in that corner piece. The hologram, in effect, is simply the same image repeated over and over again to produce the hologram's whole image. Tearing the corner piece from the hologram does not fragment the image; we can reproduce the whole image of the hologram from just that one corner piece. No matter how small the piece we tear off, the same is true because the image is repeated at each and every level. The image is the same but there is one major difference: the smaller the piece, the more blurred the image is.[17] Look at a larger corner piece and notice that the image's resolution is improved, the pattern itself looks richer because the same image has been repeated more times, adding more depth to the image. The resolution is sharper because more information is embedded in the larger piece.

Margaret Wheatley believes that fractals help to explain the patterns that nature assigns to form clouds, landscapes, circulatory systems, trees, and plants. She also believes that the hologram metaphor is important for understanding how customers view organizations. A person's opinion of a certain company is, by and large, a composite of the interactions that person has had with certain employees from that company. The

customer's view of the whole is dependent on his interactions with individuals within the company. Those employees are reflections of the company's image. However, Wheatley warns against trying to measure the individual aspects of the company.[18]

> Fractals, in stressing *qualitative* measurement, remind us of the lessons of wholeness we encountered in the systems realm. What we *can* know, and what is important to know, is the shape of the whole...Fractals suggest the futility of searching for ever finer measures of discrete parts of the system. There is never a satisfying end to this reductionist search, never an end point where we finally know everything about even one part of the system. When we study the individual parts or try to understand the system through its *quantities*, we get lost in a world we can never fully measure or appreciate.[19]

In no way does this lessen the importance of each of the individual images. But the richness and the depth of the system's pattern , the hologram, is dependent on the unifying concept of those simple images layered on top of each other.

What provides this vision for the system? What allows the individual part to join in putting the needs of the system above the needs of itself? Complexity theorists believe the answer relies on an attractor. An attractor is "what the behavior of a system settles down to, or is attracted to."[20] The form that a fractal makes is the attractor's imprint on that system. The attractor is the image from which the hologram is derived. The image's pattern and crispness in the hologram are dependent on the strength of the attractor. An attractor need not change in order for a system to be adaptable; the attractor provides the needed stability for the system to venture out and try new behaviors, the system's resiliency ensured by the attractor. The attractor provides the bedrock which the system can rely on while it is trying new behaviors to remain viable in the world.

This evolution in the system's behavior and makeup allow it to survive in the changing environment. Actually it is much more than just evolution, adapting to meet

one's needs. It is coevolutionary, meaning adapting to meet each other's needs. Darwinian theory stresses the competition required in evolution, the "natural selection" which determines which species survive and which ones do not. Coevolution acknowledges competition but also emphasizes the importance of the cooperation required in evolution.[21] Some complexity scientists believe that cooperation is a form of the self-organization property that a complex, adaptive system needs for evolutionary success: "Cooperation generates more complex structures, whereas natural selection chooses which of these can survive."[22] Stuart Kauffman puts it another way:

> ...for as we evolve, so do our competitors; to remain fit, we must adapt to their adaptations. In coevolving systems, each partner clambers up its fitness landscape toward fitness peaks, even as that landscape is constantly deformed by the adaptive moves of its coevolutionary partners.[23]

The ability of a system to adapt to changes is directly related to this idea of coevolution. The system coevolves, or learns, from the feedback it receives from its environment as the environment itself evolves. But information in any system is never perfect, often far from it. The system must learn to adapt not only from what the feedback tells it but also in what the feedback fails to tell it. The system must deal with uncertainty at every level. Systems which rely too much on stability will fail to adapt and therefore will do little or nothing to enhance themselves. The uncertainty freezes their ability to react.

Complex, adaptive systems, however, embrace the uncertainty, realizing that their competitors are also facing uncertainty.

> The ability to accept uncertainty and tolerate ambiguity might become an essential aspect of personality that has to deal with an unpredictable environment. Accepting uncertainty includes the ability to be in confusion as a necessary element in the process of interacting with a nonlinear world.[24]

A system must accept the uncertainty inherent in the environment, understanding that there will always be situations with no apparent solutions. A complex, adaptive system understands also that more information does not necessarily mean a reduction in uncertainty. In order to keep pace with a changing environment, a system must be able to learn and adapt from the information it receives.

Alfonso Montuori defines two types of learning. The first is maintenance learning: the amount of information is important, not necessarily the understanding of the information. He wrote that "maintenance learning allows us to learn only within a preestablished framework, but does not allow for free enquiry."[25] This type of learning is evident when memorizing the nine principles of war and knowing their definitions, but failing to understand their application on the battlefield. The second type is evolutionary learning in which he wrote that, "The focus of our entire educational thrust shifts as we attempt to foster a capacity rather than fill a container with information."[26] Think of a glass of water. Maintenance learning deals with the amount of water present in the glass, always trying to fill the glass as full as possible. Evolutionary learning concerns itself with the capability of the glass to transform to accept more water than the original glass. "Thinking outside the box" makes the glass bigger. This learning concerns itself not only with the amount of water present in the glass, but also with the water not present in the glass, or the uncertainty. Evolutionary learning accepts the fact there are few, if any absolute truths. This learning requires a system to immerse itself in uncertainty and use its experience and its predictive ability to effect changes for the future. Learning allows the system to adapt continually to remain competitive.

There seems to be a lot of changing and adapting in a complex, adaptive system with little or no stability. In a world where stability is seen as "good" and fear is associated with change, systems can overlook the need for meaningful change. Margaret Wheatley replies that:

> *Disorder* can be a source of *order*, and that growth is found in disequilibrium, not in balance. The things we fear most in organizations - fluctuations, disturbances, imbalances - need not be signs of an impending disorder that will destroy us. Instead, fluctuations are the primary source of creativity.[27]

Most organizations, uncomfortable with fluctuations and disturbances, attempt to stabilize their behavior to provide more order or certainty for themselves. This attempt by organizations to stabilize their methods leads to an inability on their part to recognize and appreciate modifications demanded by changing circumstances. Without incentive to learn and adapt to the changing environment, organizations risk becoming irrelevant within that environment. In doing so, these organizations limit their ability to react to changing aspects of their environment.

Much of the discussion up until now has referred to the system's ability to forge a balance between stability and flexibility. The system reaches an internal pact, ensuring that it is not too static while avoiding rapid fluctuations which make the system's structure collapse. As the system adapts and grows it becomes more and more complex, meaning that the system is receiving more feedback because more information is being exchanged in the environment.[28] Using this definition, Frederick the Great faced far less complexity than a modern day corps commander. Frederick got most of his information from personal reconnaissance and presence on the battlefield. He could filter that information and decide on a course of action with little input from subordinates or staff

officers. A present-day corps commander relies heavily on his staff and subordinate commanders to deliver the information required to make decisions. The mere fact that staffs have continually grown is a outgrowth of trying to manage the mass of information currently available on the battlefield.

Most complexity theorists believe that complexity is irreversible; as systems adapt, they become more complex because of the increased interactions among the components of the system. More feedback requires the system to use more energy to assess the information and plan strategies for the future. This evolution and adaptation within its environment leads a complex, adaptive system to the edge of chaos.

> Complex adaptive systems, in a never ending process of adaptation and coevolution, through emergence and natural selection, bring themselves to the edge of chaos...Being poised at the edge of chaos means not being straitjacket in an unresilient structure of too much order...It means being poised in a dynamic balance with sufficient nonlinear freedom to enhance creativity, novelty, entrepreneurship, risk taking, experimentation, and discontinuous change while not drowning in totally chaotic confusion and uncertainty.[29]

The edge of chaos is the region between complete order and chaos. Complex, adaptive systems embrace the complexity at the edge of chaos because in this region they have the widest choices and the greatest latitude to effect change and remain viable. Systems which fight to get out of this region back into an ordered structure lose the flexibility required for adaptation. The edge of chaos is where the system's internal pact is the strongest. Uncertainty is more prevalent but the system's ability to deal with this uncertainty is strengthened because of the fluidity of the structure. Stuart Kauffman believes that systems on the edge of chaos, "can carry out and coordinate the most complex behavior, can adapt most readily and can build the most useful models of their

environments."[30] A linear system maintains a rigid structure, wanting things to remain the same. A complex, adaptive system retains a flexible structure, better prepared to keep pace with increasing complexity.

III. Applying Complexity to Combat

Applying complexity theory to combat may seem quite a leap of comprehension but war is in fact a complex environment that requires adaptive systems to survive and maintain relevance on the battlefield. Clausewitz, in On War, seemed to recognize that war contained many of the underpinnings of the present day complexity theory. He directly attacked those theorists who believed in fixed principles and quantities in war. His discussions of uncertainty and explanations of military action led him to conclude that the "very nature of interaction is bound to make it unpredictable."[31] Far from being mechanical in his approach to war, Clausewitz understood that the psychological effects of opposing wills created continuous interactions that no set rules or principles could aptly predict.

Without knowing the requirements for complexity, he implicitly addressed each of these requirements in his writings. The first requirement for complexity, as stated before, is that the system is sensitive to initial conditions. Remember that man can only make accurate predictions if he takes exacting measurements of all components within the system. Clausewitz, in discussing fog, friction and chance, stated that military actions were unpredictable:

> War is the realm of uncertainty; three quarters of the factors on which action in war is based are wrapped in a fog of greater or lesser uncertainty...War is the realm of chance. No other human activity gives it greater scope: no other has such incessant and varied dealings with this intruder. Chance makes everything more uncertain and interferes with the whole course of events.[32]

In essence, friction degrades performance at both the individual and unit levels. This degradation, if identified, could at the very least be known and appreciated by the commander. However, commanders and soldiers fail to identify, and thus deal with, this friction because they cannot see through the fog of war:

> The issue is not just that "for want of a nail the shoe was lost...," but that one can never calculate in advance *which* nail on which shoe will turn out to be critical. Due to our ignorance of the exact initial conditions, the cause of a given effect must, for all intents and purposes, often be treated as unavoidable chance.[33]

Situation reports become sporadic; a unit's status changes without the commander knowing it. Uncertainty grows. Accurate prediction is therefore impossible partially because exact measurements in war are unattainable.

Nonlinearity is the second characteristic for a complex, adaptive system. Clausewitz writes directly about the causes of nonlinearity in war when he refers to the unpredictability of war. Linearity requires proportionality and additivity: human interactions are neither. Clausewitz saw that the unpredictability was caused by these human interactions. First, the interactions contained within one unit trying to achieve a goal or accomplish a mission are unpredictable because of the friction and chance encompassed when men face danger, hunger, fatigue, etc. Add to this the interactions when this unit opposes an enemy unit trying to accomplish the opposite goal with its own friction and chance and the possibilities seem endless.

Clausewitz knew well the importance of each and every individual action on the battlefield and their effect on a unit in terms of friction. But more importantly, he realized that continuous interactions between the variables led to unexplained results. Clausewitz

understood that factors in war could not be isolated from the rest of their environment to explain neatly cause and effect relationships in battle.

> The business of critical analysis and proof is not very difficult in cases of this kind; it is bound to be easy if one restricts oneself to the most immediate aims and effects. This may be done quite arbitrarily if one isolates the matter from its setting and studies it only under those conditions. But in war, as in life generally, all parts of a whole are interconnected and thus the effects produced, however small their cause, must influence all subsequent military operations and modify their outcome to some degree, however slight.[34]

Clausewitz realized that breaking war down to its individual parts, removing some variables from the environment, as in a lab experiment, did not explain the complex environment of war. He favored the same holistic approach that complexity theorists do today.

Feedback is present on Clausewitz's battlefield as well. Helmuth von Moltke's maxim that, "No plan of operations reaches with any certainty beyond the first encounter with the enemy's main force"[35] is indicative of this characteristic. Commanders at all levels require feedback to list priorities, allocate resources and issue missions to their units. Information constantly streams into the commander as the battle ensues and, depending on his plan, the commander makes decisions based on his analysis of that information. Junior level commanders and soldiers also make decisions based on feedback from their environment, whether it be artillery rounds hitting next to them, a fire team buddy seemingly lost in the action or tanks appearing to their front where none were expected.

War, more than any other human endeavor, requires that man be able to adapt to his surroundings, and in this case, his enemy. Clausewitz took pains to emphasize that

the reason for this was because of the human dimension of war and the opposing wills inherent in conflict. Humans "have foresight and learn from experience. Their behavior is not only reactive, they can also anticipate events and display proactive behavior."[36] The environment is changing because forces are working at odds with each other. Units must be able to quickly adapt on the battlefield to survive against a thinking enemy who is driven by his own survivability mechanism. Just as in pure complexity theory, units change strategy to continue to survive and remain viable in changing conditions.

We stated earlier that self-organization was inherent in every living organism; like anywhere else, soldiers on a battlefield attempt to keep their identity while adapting to changes to improve their chances for survival. This survival is most successful, "when the system supports the independent activity of its members by giving them, quite literally, a strong frame of reference."[37] The independent activity and the strong frame of reference refer directly to complexity theory's emergent properties, attractors and fractals.

Emergent properties are required to effect these changes in a system's strategy. In human terms, emergence relates to initiative. Colonel J.F.C. Fuller defined initiative as "the will to act,"[38] while S.L.A. Marshall defined it as "the act of moving."[39] But there is much more to the term initiative than merely an energy or impetus behind an action. In FM 100-5, the authors wrote that, "Applied to individual soldiers and leaders, initiative requires a willingness and ability to act independently within the framework of the higher commander's intent."[40] Much more than just possessing the force required for initiative, soldiers must also display an insightful aptitude to know when that initiative is required or called for in combat. Soldiers retain the energy required for initiative because of their

need for self-survival; this necessity encompasses an entire unit through the interactions of the individual soldiers toward a collective aim. S.L.A. Marshall referred to the collective aim as the "terms of references of the plan." He went on to write that:

> I think we can put it down as an axiom that initiative is a desirable characteristic in a soldier only when its effect is concentric rather than eccentric: the rifleman who plunges ahead and seizes a point of high ground which common sense says cannot be held can bring greater jeopardy to a company than any mere malingerer.[41]

Defying "common sense" can sometimes garner a huge advantage on the battlefield. The important point to remember is that initiative can only be beneficial if it furthers the accomplishment of the unit's overall goals.

In a changing environment, does knowing the concept of operation and scheme of maneuver in an operations order enable a subordinate to use initiative to accomplish the unit's goals? Or is the subordinate faced with trying only to make the original concept and scheme successful in changing circumstances? General Wayne A. Downing believed that "He who acts without reference to what his superior is trying to accomplish just adds to the confusion. But immediate, independent action guided by the commander's intent is both timely and effective."[42] Knowing merely the concept and the scheme of maneuver is not enough; the subordinate must know and understand the purpose for himself and his unit's actions.

The commander's intent is that attractor in complexity theory - the unifying concept needed for the system to survive.[43] When a commander issues his intent, he is saying to his subordinates that no matter what happens to the original plan, the intent must be adhered to. Subordinates must use their energies and creativity to move freely

within the framework of the commander's intent.[44] The intent is the catalyst and provides the frame of reference for commanders and soldiers to base their decisions on. Initiative includes the will to act within the context and confines of the original plan. But more importantly, initiative is understanding when the original plan becomes irrelevant to the current situation and adapting, using initiative, to attain the commander's intent.[45]

This understanding of the commander's intent is crucial, for we said that initiative can only be beneficial if it furthers the goals of the organization. The commander's intent and subordinates' ability to understand it refer directly to the fractals in complexity theory. Remember the photograph and hologram metaphors used for the explanation of a fractal. Apply these metaphors to the situation where the Alpha company commander has received his mission and is performing his own mission analysis. The operations order gave him the intent for both the brigade and battalion commanders. He has been tasked to be a supporting effort for Bravo Company's main attack. He also understands that his battalion is the main effort for the brigade. The Alpha company commander forms mental images of the overall operation through the commanders' intents in the order and interprets his function within those intents.[46] His responsibility is to take the actions required to make his mental image become reality.

Now let's look at the photograph metaphor for this situation. Tear off a corner of the photograph and part of the whole picture is removed. The picture is fragmented and we cannot reconstruct the entire photograph from merely that corner. But the idea of a commander's intent is holistic, meaning that it refers to the entire organization and its survival and success. The intent gives the company commander a view of the entire

image of the organization, much like a hologram. Tear a corner piece from the hologram and from that corner piece, we can reproduce the entire image. The subordinate commanders see the entire image from different perspectives, however. Their perspective of the image depends on their purposes within that image.[47] Consider a baseball field where the outfield wall consists of a wooden fence. Three boys watch the game through holes in the fence, each from a different location. The boy watching the game from left field sees the same game, the same image, as the boys in center and right fields. But the boy in left field sees the game from his unique point of view, much like a subordinate commander reads the commander's intent.

If Bravo Company, in its entirety, is unable to perform the main attack (its piece of the hologram torn off), one of the platoons, squads, or even one of the soldiers may still achieve the original intent if the mental image is properly conveyed through each level. The Alpha Company Commander can also assume that mission, or recreate the image, because he understands the overall intent of the organization. The intent of each subordinate unit needs to support and reflect the higher unit's intent. A brigade's ability to survive on the battlefield is directly related to the ability of the battalions, companies, platoons, squads, fire teams and individuals to reflect the brigade's intent in their own intent. Through this nesting process, the resolution of the image, or the intent, grows stronger and richer as each individual and component within the system understands the overarching goals of the system.

However, knowledge is irrelevant without a resolve to put that knowledge into action. A unit that understands the commander's intent but does not possess the ability to

transform the intent into reality is of little use on the battlefield. The ability of a unit to take the required action is a result of the will of the commander and his subordinate leaders as well as the discipline of each soldier in the unit. Will and discipline provide the resolve needed for action. Merely acknowledging will and discipline as important concepts is not enough. We also need to understand why and how they are important and if any limitations exist in their application in combat.

A common misunderstanding is that military discipline leads to inflexibility and rigid thinking. However, proper discipline and initiative work together in combat. Colonel Ardant du Picq, throughout his treatise, Battle Studies, emphasizes that the importance of discipline is that it enables units to possess a united effort on the battlefield. He also stresses that this unity, although requiring a firm and solid underpinning, needs to be flexible in order to retain and gain strength.[48] How does discipline achieve this firm but yielding foundation and, more importantly, what part does this discipline play in facilitating emergent behavior, initiative, on the battlefield?

Major Kevin S. Donahue, in his monograph on the subject of discipline, provides a framework for understanding how discipline and initiative can be reconciled on the battlefield. He lists nine functions of discipline and then separates these functions into two groups, the distinction being the manner in which the function is instilled in the soldier. In the Discipline B(ehavior) group, he places the following functions: obedience, synergism, attention to detail, restraint and stress resistance. The soldier receives these traits through training, what Major Donahue calls a "skill" category. The Discipline A(ttitude) group consists of courage, identification, internalization and initiative. These

characteristics are implanted in the soldier through inspiration, education or leadership, "will" categories. He defines Discipline (B) as being, "externally enforced or learned habitual behavioral responses, both conscious and unconscious" while defining Discipline (A) as, "voluntary, self-sustaining, value-based attitudes."[49]

Discipline (B) is most commonly associated with spit-shined boots, short haircut, starched uniform, snappy saluting, etc., traits denounced as having little relevance on the battlefield. But this type of discipline also includes weapon cleanliness and operability, a soldier's response to orders, and the ability to perform immediate action on his weapon system, traits with important applications to combat. This discipline enables leaders to train immediate action drills and battle drills, trusting that their unit will execute the drill when required by circumstance. It is a linear approach to fighting, executing pure, violent action to overcome the threat instead of adapting by analyzing feedback. This type of discipline is important because it puts some certainty on the battlefield. Certainty is created for a soldier by knowing how to react when his weapon misfires or by knowing his unit's reaction when surprised by a near ambush. This discipline type, therefore, is a necessary ingredient for the combat soldier.

A leader must understand, however, that the types of traits inherent in Discipline (B) are less important for their singular acts than because they signal an adherence to standards.[50] Discipline for the sake of discipline is the wrong approach for, "while there is nothing wrong with using a meat thermometer to determine how the roast is cooking, there is a fundamental problem when one attempts to use the meat thermometer to cook

the meat."[51] A soldier's adherence to standards will usually produce a pride in himself and in his unit, as long as those standards are legitimate to the soldier.

Having stated that Discipline (B) is a necessary ingredient on the battlefield, we need to realize that this "compliant" discipline is not sufficient. A soldier must also have the attitude which entails a commitment to his unit and his fellow soldiers. This attitude is contained in Discipline (A). As Discipline (B) is du Picq's solid structure needed for unity of effort, Discipline (A) provides the flexibility required to keep the integrity of the structure intact. Leaders must build the "iron" structure first and then temper it to provide it with the means to withstand the strongest of forces. While Discipline (B) affects a soldier's outward behavior, Discipline (A) influences a soldier's internal attitude. This attitude fosters a soldier's commitment to do more than just the accepted standard and nurtures an enthusiasm to employ his energies and talents to accomplish the purpose of the unit. [52]

Leaders develop this attitude by creating a vision for the unit, fostering trust with their men using the Be, Know, Do example, giving purpose and meaning to each soldier's duty and creating and maintaining a learning environment for their soldiers to improve themselves. The leader's vision provides a purpose for the discipline; the vision provides a compass to guide the soldier's actions in combat. Discipline (A)'s effects are much harder to measure and therefore some leaders revert to compliance and appearance because the gains can be seen in everyday duties. This singular measurement is a false illusion of a unit's discipline; leaders must work to promote both the soldier's behavior and attitude. By doing so, leaders will foster the dual aspects of discipline needed to

promote a trained and viable fighting force on the battlefield. Discipline, properly applied, provides a powerful engine affecting both a soldier's conduct and will leading to emergence in combat.

Recall J.F.C. Fuller's definition of initiative: "the will to act." What importance does a commander's will play on the battlefield? Acknowledging that a commander's will is important, we need also to realize why it is important and what, if any, boundaries are established for this will to be successful. Fuller believed that a subordinates' freedom of action within an overall framework was imperative, since, "delegation carries with it responsibility, and responsibility can only economically be centred in the will of one man. Without this centralization of will true initiative becomes impossible."[53] The battlefield, more than any other environment, pits man against man, force against force in a desperate contest of survival. Because of the opposing forces, Clausewitz's fog, friction, danger and chance make most positive actions difficult. The commander's will is a driving force, an impetus, for his unit to accomplish those actions needed to complete a mission. But there are definite boundaries associated with will.

> The will does not operate in a vacuum. It cannot be imposed successfully if it runs counter to reason. Things are not done in war primarily because a man wills it; they are done because they are do-able...What he asks of his men must be consistent with the possibilities of the situation. *What can be successfully willed must first be clearly seen and understood.*[54]

Professor James J. Schneider reinforces the idea of will being viable only if it is used with sound judgment. He defines will as the "raw power" which propels a mental image into action. But this will must be aligned with the commander's intent and with human nature which on the battlefield relate to a soldier's capabilities. That is what Fuller meant by

"do-able" and "consistent with the possibilities of the situation." A soldier must know his own limitations to effect will and a leader must know both his own and his soldiers' capabilities. Without this sound judgment, will turns into obstinacy, marked by inflexibility and an unwillingness to submit to reason.[55]

Sound judgment is therefore needed by both leaders and soldiers to use appropriately initiative to remain viable on the changing battlefield.

> Military judgment clears through the ambiguity of the battlefield. In war order, knowledge, and cohesion become chaos, confusion, and disorder. This creates new variety: information without meaning. Human judgment works on this raw material we call ambiguity and turns it into understanding.[56]

Judgment is the final lens needed for understanding. It is the filter which enables knowledge to become understanding. Think of an eye exam. The eye doctor keeps changing lenses on the mechanical frames to help the patient read the eye chart on the wall. The patient is frustrated because he can almost pick out the bottom two rows of letters, but they remain vague and indistinct. And then the optometrist places new lenses on the frame and the patient can "see" the last two rows. They were there all the time, but he could not see them until he used the proper lenses. Using sound judgment is akin to using these lenses, seeing and understanding the dynamics of conflict, human nature and one's abilities to give meaning to the feedback, all this information, present on the battlefield.

Judgment is not just the final piece of the puzzle of using initiative, but the keystone to the idea of exercising initiative to ensure an organization's continued viability. Judgment is the characteristic which enables individual and collective will, spurred by discipline, to use initiative to survive at the edge of chaos on the battlefield.

As the situation changes, this judgment is the basic ingredient needed for an organization to make decisions within the higher commander's intent to accomplish the mission.

IV. The Need For Uncertainty In Training

It has been said and written many times that good judgment comes only from experience on the battlefield. With little or no combat experience in the Army today, leaders and soldiers rely on individual and unit training to prepare them for the battlefield. Army training will not prepare units for combat unless the training emphasizes the need for soldiers in those units to use their judgment in combat situations. General Downing relates the following story when he was observing a battalion commander who continued an attack with a method that left soldiers in his battalion exposed to massive ground fire, movement slow and ponderous and command and control disintegrating under enemy pressure.

> I finally asked the commander why he continued to press home the attack in this particular manner. He replied, "We practiced this type of maneuver two weeks ago, and it worked like a charm. The leaders and troops have got the plan down pat. We'll make this thing go!"[57]

This commander failed to understand the essence of training for combat. He did not adapt to the changing conditions. By employing the same type of maneuver as before, he failed to appreciate the unique situation that he was presented with. His fixation on successfully performing this maneuver left him focusing on the task instead of the purpose. Most likely his order focused on the mechanics of the mission, the method, as opposed to the intent of the mission. The commander was fighting the plan and not the battle.

A commander forfeits his opportunity to employ a force capable of adapting when he fails to emphasize his intent to his subordinates. His subordinates' ability to self-organize and use initiative to create opportunities on the battlefield is hampered with no overarching vision. The commander's vision is the self-organizing force under conditions of uncertainty. Without a vision, the soldiers expend their energies trying to make the maneuver work instead of using discipline, will and judgment to accomplish the purpose of the mission. General Sullivan attacked the rigid mindset displayed by this commander when he wrote that "Fostering creative, adaptive behavior is the essence of leader development."[58]

FM 100-5, the Army's self-described keystone doctrine, also emphasizes the need for creative and imaginative leaders and soldiers. The authors discuss the uncertain environment of the battlefield and the importance of the human dimension in overcoming friction and fog. They discuss the importance of intent and its utility in providing the unit with an overarching goal. The authors implore the reader to "regain the initiative", "take the initiative", "look for opportunities" and "anticipate events" to destroy the will of the enemy and defeat him. An entire chapter is devoted to sharing with the reader the importance of the human dimension: determination, discipline, will, spirit, perseverance, initiative, resilience, etc. Simply, the authors of this manual grasp that the most important component involved in combat is the human side. They understand that a soldier, given an intent - a purpose for being on the battlefield, will use his energies to accomplish that higher vision. A soldier is not born with these qualities. He must learn when and how to expend his energy, use his initiative, to enable his unit to self-organize

and adapt to the changing conditions in combat. A soldier can apply discipline and will in conjunction with sound judgment only through learning.

> On the day of battle, soldiers and units will fight as well or as poorly as they are trained. Training to high standards is essential in both peace and war; never can Army forces afford not to train and maintain the highest levels of readiness...Leaders have the responsibility to train subordinates. This may be their most solemn responsibility.[59]

Training is the vehicle for a soldier's education. Leaders who constrict a soldier's freedom of action in training retard the soldier's education. Leaders who expand a soldier's opportunity to use initiative in training enhance the soldier's chance to gain understanding and use judgment.

The ability to use sound judgment to employ initiative is not gained through maintenance learning in training. Using maintenance learning in training limits a soldier's freedom of action, restricting him to simple techniques and procedures. The soldier's actions are not driven by an overriding purpose; he executes tasks to support the concept of operation. However, the crux of evolutionary learning is the soldier's ability to apply his knowledge to a given situation. Clausewitz refers to this as "presence of mind" which is, "nothing but an increased capacity of dealing with the unexpected."[60] Recall the glass metaphor; think of a glass as a soldier's mind. Merely pouring more water into the glass, putting more information in the soldier's mind, adds to the volume of knowledge but does not change the glass in any way. But through evolutionary learning the glass expands in order to reshape and rearrange its capacity for thinking. Simply, a mind once stretched by a new idea never regains its original dimensions. Evolutionary learning is not concerned so much with truisms, rules and maxims as it is

with a person receiving information, leading to knowledge which increases his understanding and perception of his environment.[61]

A soldier's education requires that he learn techniques, but more importantly he must learn how to apply these techniques dependent on the situation. Omar Bradley recounted the following when writing about training:

> In field exercises, both Marshall and Stilwell would deliberately create disorder and confusion during the problems, throwing in the wholly unexpected in order to encourage almost instantaneous clear, correct, improvised solutions. One of the student officers in tactics that year, Matt Ridgway, who was subjected to one of these contrived confusions, profited by it and declared that that sort of "mental conditioning" was "more important to a combat officer than any number of learned techniques."[62]

Without adding unforeseen events into training, we do not give leaders and their soldiers the opportunity to apply their judgment to solve problems. Simply grading them on their ability to maintain order on the battlefield does a disservice to those soldiers. Complete order will never exist on the battlefield; removing variables of friction and chance from a training exercise undercuts the soldier's learning experience.

Providing certainty in training nullifies a soldier's opportunity for an education. By introducing and emphasizing uncertainty into training, trainers force soldiers to make decisions and use initiative to fight through fog and friction. Soldiers learn and grow in this training environment. Their fixation on tasks and methods slowly transforms into an ability to adapt to changing circumstances. Soldiers grow confident in their ability to handle uncertain situations. Purpose provides them with a beacon to guide their actions through the ambiguity.

Training's overriding purpose must be to prepare the unit for the uncertainty of combat. Commanders must ensure that their training is challenging, meaning that a unit is forced to adapt in a training exercise in order to accomplish its mission.

> It therefore follows that the far object of a training system is to prepare the combat officer mentally so that he can cope with the unusual and the unexpected as if it were the altogether normal and give him poise in a situation where all else is in disequilibrium.[63]

S.L.A. Marshall wrote this in 1947. Clausewitz wrote of uncertainty during the Napoleonic era. Uncertainty has been present on the battlefield ever since men faced each other with survival as their ultimate goal. Uncertainty is not a new fad or gimmick, here today and gone tomorrow. It is and will be on every battlefield for as long as armies oppose each other.

Complexity theory provides a framework for understanding how units can adapt and survive on the battlefield; commanders can only effectively train their subordinate units by applying this framework through realistic and challenging training designed to improve soldiers' judgment. By introducing and emphasizing uncertainty in training, we force soldiers to use initiative in training to accomplish a mission, increase their capacity for sound judgment and foster their ability to know when to use initiative to support the unit's goals. We also increase their propensity to employ that initiative in combat because of the experience gained in training.

V. Army Training Doctrine and Reality

Army training doctrine is contained in FM 25-100 and FM 25-101. The manuals provide a "walk-through" on how to develop a Mission Essential Task List (METL), plan, execute and assess the training. Nine principles of training are used to provide

direction to trainers.[64] These principles, "are analogous to the *Principles of War* in FM 100-5. They provide the general guidance and overarching direction for conducting training at all levels."[65] In explaining these principles, the authors express the need to train soldiers in realistic scenarios, making them cope with complex and diverse situations within the training environment.

Training is described in a number of ways, descriptive adjectives being tossed around on practically every page of the manuals.[66] Each of these play a part in the utility of training for the soldier and the unit. But in applying numerous descriptors to what training needs to be, the doctrine delivers a shotgun blast, failing to focus on the essence of training: preparing leaders and soldiers for the uncertainty of combat.

Although far more elaborate, the training doctrine contained in FM 25-100 and FM 25-101 can be reduced to two key imperatives: train on mission essential tasks and train these tasks to standard. The doctrine continually refers back to the imperative to "train to standard." This "train to standard" dictum encompasses all of the training descriptors previously mentioned. Training to standard in these manuals translates to the training being tough, realistic, carefully planned, well-structured, etc. Again, the authors do not focus on what "train to standard" really means.

Incorporating the nine principles of training, a leader obtains the standard for each task through Common Task Training (CTT) manuals and Skill Qualification Task manuals for individual tasks and Mission Training Plans (MTP) for unit-level tasks. These manuals provide training and evaluation programs, listing the conditions and standards for each task. The condition describes the scenario while the standard describes

the measures to be used in evaluating a unit, usually described in unit-level exercises in terms of size of force destroyed (both enemy and friendly), time and enemy and friendly dispositions.

This approach to training is appropriate and beneficial for individual training and some lower-level unit training. It specifically applies to tasks which must be performed instinctively, such as a soldier applying SPORTS immediate action to an M16 rifle misfire.[67] This type of training is also suitable for battle drills and immediate action drills, especially at platoon level and lower. Battalions and companies may incorporate these drills at their level, but in essence it is the squads and platoons who actually perform the immediate action.

But remember that the requirements for training for surprise are fundamentally different than those needed for facing uncertainty. Two key aspects are different for these terms: risk and time. Much of the risk inherent in a battlefield environment is unknown because of the uncertainty associated with fighting. Leaders may believe that they are at risk at a certain position or at a specific point in an operation, but are unsure because it has not occurred. But once a unit is surprised by an enemy force or action, the risk is then greatly known because the action has happened. The reality of the enemy's surprise action does not comply with expectations; surprise adds certainty to the battlefield because of its action.[68] The leaders and soldiers appreciate the risk to a greater extent because it is happening to them now.

The second aspect, time, differentiates surprise and uncertainty in two ways. Quite simply, while surprise is temporary, uncertainty is permanent. Surprise is

overcome with time, but uncertainty remains constant through time. Secondly, while a commander still has time to gather feedback and make decisions in the uncertain environment, he must apply immediate action to overcome surprise. When surprised, the unit must act immediately to lessen the effects of the enemy's temporary advantage.

Armies habitually train units, specifically at the lower tactical levels, to react to surprise. This is done through battle drills and immediate action drills. React to indirect fire, react to near ambush and react to sniper fire are just a few of these drills. For most of these drills, no judgment or decision is made when the unit is surprised; the actions of the unit are instinctive and immediate. The unit's action is a model in each of the soldier's heads, put there by iteration after iteration of these drills. We employ models like these in everyday life, like, "if your car starts to skid, turn your wheels in the direction of the skid." These models are useful in everyday life just as they are on the battlefield, but their utility lies not in dealing with uncertainty, but with surprise. For situations like these requiring instant action with no decisionmaking, the task, condition, standard training format is both fitting and relevant.

However, the task, condition, standard training format, as applied in the Army, does not prepare soldiers for the uncertainties of combat. Preparing for an environment where judgment and initiative are required to adapt to changing conditions on the battlefield, this training mentality emphasizes discrete tasks with largely known scenarios. Each component of the training format adds certainty to the training exercise, minimizing the opportunity for leaders and soldiers to learn and grow in a realistic combat scenario.

The task portion of this format diminishes the use of initiative in two ways. First, the unit knows the tasks it will be evaluated on prior to the exercise. Think of a company situational training exercise(STX); the training memorandum or order lists the evaluated tasks for each lane prior to the execution. For instance, a mechanized company in a defend STX may be required to perform the following tasks: defend; emplace an obstacle; support by fire; withdraw under enemy pressure.[69] The commander is certain of the required tasks and focuses only on those tasks which will be evaluated. The commander therefore has no uncertainty in reference to the required tasks for this exercise. Compare this training approach with actual combat; the enemy will not be so gracious to inform the commander of the specific tasks required to complete the mission. Second, in focusing on the tasks required to successfully complete the STX, the trainer overlooks the importance of the commander's intent in providing the overarching vision for the unit. The unit fixates on the successful performance of discrete tasks instead of the commander's intent which provides the catalyst from which soldiers base their decisions on. With little attention paid to the intent, the unit conducts the exercise in a vacuum, ignorant of its role in the overall purpose. The unit's ability to effect change is impeded by its unfamiliarity with any overarching purpose for the mission. Leaders and soldiers, intent on successfully accomplishing tasks, will use little judgment and initiative in training. They will be ill-prepared to use judgment and make decisions to combat the uncertainties they will encounter on the battlefield.

The unit is also aware of the conditions being used for the exercise. The conditions describe the overall situation for the exercise. They may describe the current

mission status, size and disposition of the enemy force and status of support capabilities. Many times the training and evaluation outlines give vague situations; this is rarely true when a unit performs the training, however. The unit may have trained on the same ground previously or the leaders may even perform a leader's reconnaissance prior to the training to familiarize themselves with the terrain. The training lane also may be so small that the benefit from terrain analysis is negligible because of the limited space. Sometimes trainers will even specify the order which tasks will be conducted during the exercise, allowing leaders to concentrate on the next task at hand instead of the overall situation. Much of this training is repetitive with limited assets for the opposing force (OPFOR). A company going through an attack lane on the second day of training may have had one of its platoons acting as the defending OPFOR unit during the first day. The company commander simply asks his platoon leader about his OPFOR mission to include defensive positions, best approach routes and limitations put on the OPFOR. Again, the commander gains more certainty with each additional piece of knowledge.

And what about the OPFOR used in the exercise? In the defense against a company, was the platoon leader allowed to place observation posts where he wanted and also allowed to patrol aggressively? Was he informed of the likely time for the company's attack? Was the platoon leader instructed to place certain vehicles or weapon systems in specific locations even though these positions did not support his defensive scheme? In short, was the platoon leader given a commander's intent and allowed to establish and fight his defense using his own judgment? Allowing the OPFOR leader the

freedom of action to fight his own battle makes his force much more than a training aid and changes the conditions of the exercise, adding uncertainty for each iteration.

This is important for another reason also. If all of the maneuver platoons in a mechanized infantry battalion see the same conditions, including the same scheme of maneuver for the OPFOR, then the learning potential for these units is confined to this one situation. Leaders and soldiers in every unit talk to each other about the exercise and the situations each of them was confronted with. If they are all confronted with the same general situation, little knowledge can be exchanged. Compare this with the learning opportunities available if each platoon had faced an enemy who fought using his own judgment, intuition and imagination. Leaders and soldiers could have endless discussions on the judgment used and initiative required to accomplish the commander's intent during the exercise.

The standard is the final part of this training format. In order to successfully complete a task, a unit must attain the standards associated with that task. The assumption is if the unit successfully achieves the standards, the unit is then trained on the task. Many trainers then continue this reasoning by deeming the unit accomplishing the mission to standard if the unit successfully completes all the tasks in the exercise. Using this logic, the "train to standard" in doctrine reverts to training to meet the standards listed for each of the tasks. The focus on realizing the commander's vision degenerates to mere performance of tasks to standard. These are two completely different uses of the word "standard". The doctrine writers for FM 100-5, in writing about training, imply that the "standard" must prepare leaders and soldiers for the fog and

friction of the battlefield. Training to meet the standard implies no such uncertainty or confusion, simply a checklist of requirements to be met to complete the task. In removing the purpose as the focal point of the exercise, trainers diminish freedom of action, curtailing initiative and self-organization attempts by the unit. Knowing the tasks to be trained, the conditions for the scenario and the specific standards needed to perform the tasks, a unit's training can easily turn into a blocking and tackling exercise. In this type of training environment, leaders mostly direct muscle movements. Focusing only on tasks, conditions and standards limits training which emphasizes the mental agility required by leaders and soldiers to adapt and react to changing conditions.

Consider a squad STX lane. Using ARTEP 7-8-MTP, we design a lane for the squad to train on the attack mission. We choose four collective tasks for evaluation: prepare for combat; maintain operation security; move tactically; assault.[70] In addition we include a battle drill, react to indirect fire, during the tactical movement task. For simplification in this paper, we will focus on the evaluation of the squad leader.

Each of the tasks comes with associated conditions and standards. A sampling of the conditions include: squad has received an order; enemy has capability to detect the platoon visually, audibly and electronically; both friendly and enemy forces have indirect fire and close air support are available; an enemy machine-gun section is occupying a defensive position; squad is directed to attack the enemy.

The standards for these tasks include: unit moves on time; preventive maintenance checks and services have been performed on all systems; the unit prevents the enemy from surprising its main body; the squad uses active and passive noise and

light discipline factors; the leader selects the movement technique based on the likelihood of enemy contact; squad sustains no more than 20 percent casualties; squad sustains no casualties from friendly fire. Each task contains a checklist of subtasks and standards with a go or no-go grading system.

The STX memorandum informs the squad leader of the tasks to be evaluated. He trains his squad on these tasks in preparation for the evaluation. Meanwhile the evaluator is picking the piece of terrain. Because of the tactical move task, he must find a lane where the squad leader can move unobserved to the objective. He also chooses ground which provides the squad leader with a good support element position for the assault.

Now comes the day of the squad evaluation. The evaluator briefs the OPFOR, telling them to be in position at a certain time. Their position must be oriented towards the open area in the south. Also, the position must be on the east side of the hill; the squad's supporting position must be able to suppress the position during the assault.

The squad receives a FRAGO. The squad's task and purpose is to destroy the enemy section in order to allow their platoon to bypass the objective to the west. The platoon is tasked to secure a bridge to the north of the squad's objective to facilitate a company attack to the north. The evaluation begins with troop leading procedures. The evaluator is carrying a clipboard with the training and evaluation outlines for each of the tasks. He observes the squad's actions and gives the squad a go or no-go for each subtask. The squad leader has been evaluated before; he carries the same checklists with him, ensuring his squad successfully achieves each of the listed subtasks to standard.

The squad begins its movement towards the objective, moving inside the woodline on the eastern side of the lane. The squad leader controls the movement. The evaluator is grading, among other things, noise and light discipline, movement techniques and reporting procedures. The squad reacts to indirect fire and continues moving to the objective. The squad leader places the support element in position and prepares the rest of his squad for the assault. The support element fires to suppress the enemy position. The rest of the squad performs the assault. The squad leader signals to lift or shift suppressive fires and the assault element clears the objective. The training lane is complete. An After-Action Review (AAR) follows.

You are now the squad leader. The evaluator turns to you at the beginning of the AAR and asks, "What did you learn during this training event?" What do you tell the evaluator? Do you look at your task checklists and highlight some subtasks that need to be improved? You might need to develop a better signal for lifting and shifting fires. Maybe you need to emphasize equipment checks because some of your soldiers were making too much noise during movement. You may, in fact, produce a laundry list of needed improvements. Your laundry list refers directly to tasks and the standards required to successfully achieve those tasks. The teaching points revolve around and are fixated on the evaluated tasks and their associated standards.

But what did you learn? Were you confronted with any situation which required judgment on your part? Did the enemy use his opposing will against you and force you to adapt to a changing environment? Was any initiative required by you or your soldiers to accomplish the mission?

If the answers to the last three questions are "no", then the training failed to accomplish its primary purpose: preparing a unit and its soldiers for the uncertainty of combat. The training accomplished in this STX lane resembles a lab experiment. The evaluator chose the ground to support the tasks and isolated specific tasks to determine cause and effect relationships. Successfully accomplishing each of the specific tasks equaled mission success. The evaluator easily performed the evaluation. The checklists were the evaluation for both the evaluator and the squad leader. The results were clear and easy to see - just look down the go and no-go columns to evaluate success.

This approach to training would be successful if the enemy were gracious enough to comply with the evaluation checklists. Therein lies the problem. The enemy is a thinking entity doing everything possible to add confusion and ambiguity to the battlefield. He will attempt to confuse, deceive and outwit his enemy. The enemy will make decisions and take actions to frustrate and thwart his foe's scheme of maneuver. On the squad STX lane, the enemy machine-gunner, realizing his eastern flank is vulnerable because of the adjoining woodline, may position an early warning trigger to alert him of approaching forces. Whether the early warning be by mechanical means or an observation post, the machine-gun crew will be ready to move to an alternate position to cover their flank. The enemy may call for indirect fire in the woodline also.

Facing this enemy, what does the squad leader do? Poring over his task checklists will not provide the answer. The enemy has drastically changed the situation. The squad's mission will fail if the squad continues to fight the plan. Quite simply, the squad leader must look to his guiding beacon - the purpose for the mission. His purpose is to

allow the bypass of the objective to the west by the rest of his platoon. What must he do to achieve his purpose? His task is to destroy the machine-gun crew. The squad leader determines he cannot achieve this task with the changed conditions. He decides he can still attain his purpose if he fixes the enemy crew in their alternate position. From there, the enemy cannot fire to the west; the squad leader's platoon will be able to bypass the hill without being subjected to direct fire from the machine-gun crew. The squad leader may decide on another course of action as long as it complies with the purpose of his mission.

The important point is that the solution was not spelled out on a piece of paper. The solution was in the squad leader's mind. The commander's intent provided the squad leader with a mental image. The squad leader used this image to fight through the enemy's attempt to thwart the mission. The squad leader's mental image was the unifying concept. The image provided him freedom of action, allowing the squad leader to adapt, use his judgment and take the initiative required to accomplish the mission.

This type of training accomplished the primary purpose of preparing units for uncertainty in combat. The answers to the three questions are now "yes." The squad leader was required to use his judgment. He was forced to adapt to a changing environment. He was required to use initiative to accomplish the mission.

The squad leader will never see this exact situation again. He will not be able to use the same actions in future training or combat because each situation is unique. But by doing this exercise the squad leader's judgment matured. His willingness to take the initiative increased. He improved his ability to function in an uncertain environment,

better prepared to deal with ambiguity in the future. He learned because he was given the freedom to make decisions and take the initiative in order to accomplish his purpose.

VI. Recommendations

The recommendations listed below focus on the need for uncertainty in training. These recommendations are meant to be used in varying degrees depending on the training level of the specific unit. Leaders must use their judgment in determining the amount of ambiguity and uncertainty to allow in the training exercise. Throwing a platoon leader just out of Infantry Officer Basic Course into an exercise full of confusion and turmoil may undermine his ability to lead the unit in the future. At the same time, coddling leaders and soldiers leads to ineffective and unresilient units. These recommendations are by no means all-inclusive but recognize that complexity and uncertainty are part of the natural "atmosphere" of war. Leaders can draw from their own education, training and experiences to force soldiers to make decisions in uncertain and ambiguous situations.

A prerequisite for this training is the willingness of leaders and soldiers to admit mistakes in front of superiors, peers and subordinates. This can only begin at the top level of an organization because, "a subordinate's willingness to admit mistakes depends on the commander's willingness to tolerate them."[71] Leaders do not need to be the primary instructors but they do need to create a learning environment where mistakes are accepted as an inevitable result from training for combat. Although evaluations are necessary, the emphasis needs to be on the development of the junior leaders and soldiers.[72]

Commanders need to change their mindset with respect to the OPFOR. Instead of thinking of this unit as an opposing force, we need to see the OPFOR as a force with an opposing will in the training exercise. The former is merely a training aid for the unit being evaluated; the latter is a viable, thinking enemy creating uncertainty and difficulties for the evaluated unit.

> Exercises...should introduce friction in the form of uncertainty, stress, disorder, and opposing wills. This last characteristic is the most important; only in opposed, free-play exercises can we practice the art of war. Dictated or "canned" scenarios eliminate the element of independent, opposing wills that is the essence of combat.[73]

Trainers should give no special information or guidance to the OPFOR. They should be given a commander's intent which is at cross-purposes with the evaluated unit. Many commanders shy away from this because of the greater chance of the two units never physically meeting in the training box. This is part of the learning experience, however. Trainers must ensure the commander's intent for the two forces is clear and at cross-purposes with each other. If the units do not engage each other during the training exercise, the trainers need to highlight this in the AAR. Understanding why one or both of the units did not react in consonance with the intent will provide learning for all of the participants.

In concert with the previous recommendation, commander's intent needs to be emphasized during all unit training events. If the Army is indeed committed to commander's intent, we need to train tactical units using purpose instead of an emphasis on completing discrete tasks to accomplish a mission. The difference between emphasizing an overall purpose versus a collection of tasks is immense. The intent is the

self-organizing mental image for the unit, providing a framework which gives the leaders and soldiers in that unit the freedom of action to use their judgment to accomplish the mission. Assigning a collection of tasks to a force only provides the force with a list of requirements to complete a mission. General Downing wrote that, "Commanders should consider structuring training events where a subordinate must violate his specific instructions, to include control measures, in order to accomplish the unit mission and support the commander's intent."[74] His point is that although tasks are important, they are only a doctrinal attempt to break the purpose into military terms. With little emphasis placed on the purpose of the mission, leaders and soldiers are ill-equipped to use initiative during a training exercise. Soldiers cannot be expected to know when and how to use initiative on the battlefield if the concept is not trained in peacetime.

Trainers need to ensure that the conditions for the training exercise remain vague. Units should know the mission and the intent, but not the tasks they will need to perform. This uncertainty, by itself, will force units to refer back to the commander's intent to make decisions during training. This reinforces the importance of understanding the intent for the mission. Requiring soldiers to react to unforeseen events hones the soldiers' ability to use judgment in applying their will against the enemy.

Commanders need to understand and be able to recognize the difference between "training to standard" and training to meet the standards. The unit's ability to fulfill the commander's intent should always be the standard. A checklist mentality often results from using a training and evaluation outline. This narrow focus leads to the standards becoming the exercise, regardless of whether they played a part in accomplishing the

purpose of the mission. This fixation leads to fighting the plan as opposed to fighting the fight. Leaders should forbid the use of a checklist as an evaluation tool. A unit's ability to accomplish its mission in an uncertain environment, using the commander's intent as its guide, must be the standard. Nothing must overshadow the true purpose for the exercise: preparing soldiers for the uncertainties of combat.

Expect this training to be tougher on both the evaluator and the unit. The evaluator needs to study the terrain and analyze both missions to ensure he is giving meaningful orders with commander's intent. He must think hard to make the intents for the evaluated unit and the OPFOR at cross-purposes with each other.

The unit may initially be thrown into confusion, unable to readily adapt and function in a changing environment. The trainer will learn that evaluating this type of training is much harder than before; he needs to apply brainpower instead of checking lists. Cause and effect relationships are not apparent; many variables are at work in this training. The unit struggles to maintain itself against a force with an opposing will.

Just remember this - the unit will self-organize. Leaders and soldiers will make decisions and take the initiative to overcome obstacles and accomplish the mission. Many times they will make the wrong decisions. This is learning. Build on their mistakes as well as their successes. By emphasizing uncertainty in training, we will develop soldiers who can adapt and make timely decisions to accomplish their mission.

VII. Conclusions

Complexity theory has been used as a framework to explain the military consequences of opposing wills fighting for survival on the battlefield. Commanders

must be able to use feedback to anticipate the future and make the appropriate changes to remain a viable force. Only by displaying sound judgment and employing initiative can soldiers combat the friction, fog and uncertainty inherent in combat. A thinking enemy will add to the confusion; we must prepare our leaders and soldiers to defeat this enemy through domination, adaptation, sound judgment and quick reaction.

The emergent self-organizing property on the battlefield called initiative is critical for units to adapt and react quickly in combat. Initiative requires both the willingness to act and the aptitude required to know when initiative is needed to complete the mission within the purpose framework, the commander's intent. The intent is the unifying concept for a unit, providing the frame of reference, the mental image, for subordinates to base their decisions on to accomplish the commander's purpose. Only by knowing the overall purpose of the commander can soldiers make judgments in a timely manner which further the goals of the commander and the unit. The biggest hurdle to overcome is, "related to an officer's ability to recognize a need to take initiative, willingness to take responsibility and ability to competently execute that responsibility."[75] In order to acquire the aptitude required to make sound decisions, soldiers must encounter uncertainty as part of their training experience.

Incorporating uncertainty into a unit's training exercise requires much thought and painstaking work. Soldiers must accustom themselves to working with uncertainty in order to learn and grow.

> In training, units must be conditioned to expect the unexpected...Nothing is more uncertain than the battlefield. We must teach our soldiers to adapt to any situation they might find themselves in, even if we have to create the unforeseen event in training.[76]

Introducing uncertainty into training enables leaders and soldiers to use their judgment, refining their understanding of human will in combat. This training will produce soldiers with sounder judgment, better equipped to understand and realize when they need to apply initiative in order to support the commander's intent on the battlefield.

Endnotes

[1] J.A. Houlding, Fit For Service: The Training of the British Army, 1715-1795, (Oxford: Clarendon Press, 1981), preface.

[2] A.J. Bacevich, The Pentomic Era, (Washington, D.C.: National Defense University Press, 1986), p. 121.

[3] FM 100-5, Operations, Department of the Army, (Washington, D.C.: Department of the Army, June 1993), p. 2-0.

[4] Stephen R. Mann, "Chaos Theory and Strategic Thought," Parameters, vXXII, no. 3, (Autumn 1992), p. 55-56.

[5] Uri Merry, Coping With Uncertainty: Insights from the New Sciences of Chaos, Self-Organization, and Complexity, (Westport, Connecticut: Praeger Publishers, 1995), p. 22.

[6] Alan Beyerchen, "Clausewitz, Nonlinearity, and the Unpredictability of War," International Security, v17, no. 3, (Winter 1992/93), p. 62.

[7] Merry, p. 23.

[8] Peter Coveney and Roger Highfield, Frontiers of Complexity, (New York: Fawcett Columbine, 1995), p. 192.

[9] Ibid., p. 7.

[10] M. Mitchell Waldrop, Complexity: The Emerging Science at the Edge of Order and Chaos, (New York: Simon and Schuster, 1992), p. 86.

[11] Coveney, p. 174.

[12] James P. Crutchfield and J. Doyne Farmer and Norman H. Packard, "Chaos," Scientific American, v255, no. 6, (December 1986), p. 49.

[13] Eric Jantsch, The Self-Organizing Universe, (Oxford: Pergamon Press, 1980), p. 7.

[14] Christine B. Wailand, "Evolutionary Systems Management," World Futures, v36, (1993), p. 145.

[15] Merry, p. 173.

[16] Jack Cohen and Ian Stewart, The Collapse of Chaos, (New York: Viking Penguin, 1994), p. 23.

[17] The use of the hologram metaphor for a fractal was found in Cohen, p. 270.

[18] Margaret J. Wheatley, Leadership and the New Science, (San Francisco: Berret- Koehler Publishers, 1992), p. 112-113, 128-129.

[19] Ibid., p. 129.

[20] Crutchfield, p. 50.

[21] Merry, p. 174.

[22] Coveney, p. 232.

[23] Stuart Kauffman, At Home in the Universe: The Search for Laws of Self-Organization and Complexity, (New York: Oxford University Press, 1995), p. 73.

[24] Merry, p. 143.

[25] Alfonso Montuori, "Evolutionary Learning," World Futures, v36, (1993), p. 189.

[26] Ibid., p. 197.

[27] Wheatley, p. 20.

[28] Coveney, p. 338.

[29] Merry, p. 195.

[30] Ibid., p. 141.

[31] Carl Von Clausewitz, On War, ed. and trans. by Michael Howard and Peter Paret, (Princeton, NJ: Princeton University Press, 1976), p. 139.

[32] Ibid., p. 101.

[33] Beyerchen, p. 77.

[34] Clausewitz, p. 158.

[35] Helmuth von Moltke, A Dictionary of Military Quotations, compiled by Trevor Royle, (London: Simon and Schuster, 1989), p. 42.

[36] Merry, p. 183.

[37] Wheatley, p. 95.

[38] J.F.C. Fuller, The Foundations of the Science of War, A Military Classic Reprint, (Fort Leavenworth, KS: U.S. Army Command and General Staff College Press, 1993), p. 247.

[39] S.L.A. Marshall, Men Against Fire: The Problem of Battle Command of the Future, (Gloucester, MA: Peter Smith, 1978), p. 130.

[40] FM 100-5, p. 2-6.

[41] Marshall, p. 132

[42] Wayne A. Downing, "Training to Fight," Military Review, vLXVI, no. 5, (May 1986), p. 22.

[43] Although no doctrinal manual specifically states the components of the commander's intent, Command and General Staff College texts define it as: purpose; method; end state. As used in this monograph, the emphasis is on the purpose and end state. These provide a mental image, answering the questions of 'why' and 'what' for the subordinate. The method portion of the intent is merely a summary of the concept of operation, answering how the mission is to be accomplished.

[44] Wheatley, p. 136.

[45] Randall R. Hill, Operational Initiative: What Is It and How Do We Get It?, (Fort Leavenworth, KS: School of Advanced Military Studies, 7 June 1990), p. 12.

[46] Thomas J. Czerwinski, "Command and Control at the Crossroads," Parameters, vXXVI, no. 3, (Autumn 1996), p. 128.

[47] Peter M. Senge, The Fifth Discipline: The Art and Practice of the Learning Organization, (New York: Currency Doubleday, 1990), p. 212.

[48] Ardant du Picq, Battle Studies, ed. by John N. Greely and Robert C. Cotton, (Harrisburg, PA: The Military Service Publishing Company, 1958), p. 102.

[49] Kevin S. Donahue, The Anatomy of Discipline, (Fort Leavenworth, KS: School of Advanced Military Studies, 17 December 1993), p. 20. Definitions for the listed functions are contained on pp. 11-17.

[50] Ibid., p. 32.

[51] Ibid., p. 36.

[52] Ibid., p. 28.

[53] Fuller, p. 248.

[54] Marshall, p. 175.

[55] James J. Schneider, The Theory of Operational Art, Theoretical Paper No. 3, 2d revision, (Fort Leavenworth, KS: School of Advanced Military Studies, 1 March 1988), p. 49.

[56] Ibid., p. 46.

[57] Downing, p. 19.

[58] Gordon R. Sullivan, "Delivering Decisive Victory: Improving Synchronization," Military Review, vLXXII, no. 9, (September 1992), p. 11.

[59] FM 100-5, p. 1-5.

[60] Clausewitz, p. 103.

[61] Merry, p. 142.

[62] Omar N. Bradley and Clay Blair, A General's Life, (New York: Simon and Schuster, 1983), p. 66.

[63] Marshall, p. 116.

[64] FM 25-101, Battle Focused Training, Department of the Army, (Washington, D.C.: Department of the Army, 30 September 1990), p. 1-3. The nine principles are: train as combined arms and services team; train as you fight; use appropriate doctrine; use performance-oriented training; train to challenge; train to sustain proficiency; train using multi-echelon techniques; train to maintain; make commanders the primary trainers.

[65] David H. Ohle and John M. Spiszer, "Providing Coherence for Training Force XXI," Military Review, vLXXVI, no. 4, (July-August 1996), p. 64.

[66] Some of the adjectives to describe training throughout FM 25-100 and 25-101 are: tough; realistic; combined arms; multi-echelon; sustained; effective; relevant; carefully planned; aggressively executed; thoroughly assessed; physically challenging; intellectually challenging; doctrinally correct; safe; accurate; well-structured.

[67] SPORTS stands for Slap the magazine; Pull back on the charging handle; Observe the chamber; Release the charging handle; Tap on the forward assist; Shoot.

[68] Charles D. Franklin, Tactical Surprise: Beyond Platitudes, (Fort Leavenworth, KS: School of Advanced Military Studies, 14 December 1987), p. 9.

[69] This example is from STX P in ARTEP 71-1- MTP, Mission Training Plan for the Tank and Mechanized Infantry Company and Company Team, Department of the Army, (Washington, D.C.: Department of the Army, 3 October 1988), p. 3-8.

[70] ARTEP 7-8-MTP, Mission Training Plan For The Infantry Rifle Platoon and Squad, Department of the Army, (Washington, D.C.: Department of the Army, 30 September 1988), p. 3-2. Prepare for combat task is found on page 5-158. Maintain operation security task is on page 5-141. The tactical movement task is located on page 5-49. The assault task is found on page 5-6. All of the conditions, standards and substandards referred to later in this paper come from these pages.

[71] FMFM-1, Warfighting, Department of the Navy, (Washington, D.C.: Department of the Navy, 6 March 1989), p. 49.

[72] Kevin S. Donahue, Developing Initiative in Junior Officers, (Fort Leavenworth, KS: U.S. Army Command and General Staff College, 4 June 1993), p. 113.

[73] FMFM-1, p. 48.

[74] Downing, p. 22.

[75] Donahue, Developing Initiative in Junior Officers, p. 100. MAJ Donahue developed a decision-making model of initiative, looking at five factors: failure to recognize a need to take action; failure to accept responsibility; inability to develop an alternative plan; lack of confidence in the alternative plan; unacceptable personal risk. Expecting to find that a "zero defects" command climate was the biggest inhibitor, he instead concluded that an officer's skill level and willingness to display initiative were more closely aligned with the act of employing initiative.

[76] Downing, p. 22.

Bibliography

Books

Bacevich, A. J. The Pentomic Era. Washington D.C.: National Defense University Press, 1986.

Bradley Omar N. and Clay Blair. A General's Life. New York: Simon and Schuster, 1983.

Briggs, John and F. David Peat. Turbulent Mirror. New York: Harper and Row, 1989.

Clausewitz, Carl von. On War. Edited and Translated by Michael Howard and Peter Paret. Princeton, NJ: Princeton University Press, 1976.

Cohen, Jack and Ian Stewart. The Collapse of Chaos. New York: Viking Penguin, 1994.

Coveney, Peter and Roger Highfield. Frontiers of Complexity. New York: Fawcett Columbine, 1995.

Creveld, Martin Van. Command in War. Cambridge, Massachusetts: Harvard University Press, 1985.

du Picq, Ardant. Battle Studies. Edited by John N. Greely and Robert C. Cotton. Harrisburg, PA: The Military Service Publishing Company, 1958.

English, John A. On Infantry. New York: Praeger Publishers, 1984.

Fuller, J.F.C. The Foundations of the Science of War. A Military Classic Reprint. Fort Leavenworth, KS: U.S. Army Command and General Staff College Press, 1993.

Houlding, J.A.. Fit For Service: The Training of the British Army, 1715-1795. Oxford: Clarendon Press, 1981.

Jantsch, Eric. The Self-Organizing Universe. Oxford: Pergamon Press, 1980.

Kauffman, Stuart. At Home in the Universe: The Search for Laws of Self-Organization and Complexity. New York: Oxford University Press, 1995.

Kelly, Kevin. Out of Control: The New Biology of Machines, Social Systems, and the Economic World. New York: Addison-Wesley, 1994.

Marshall, S.L.A. Men Against Fire: The Problem of Battle Command of the Future. Gloucester, MA: Peter Smith, 1978.

Merry, Uri. Coping With Uncertainty: Insights from the New Sciences of Chaos, Self-Organization, and Complexity. Westport, Connecticut: Praeger Publishers, 1995.

Senge, Peter M. The Fifth Discipline: The Art and Practice of the Learning Organization. New York: Currency Doubleday, 1990.

Waldrop, M. Mitchell. Complexity: The Emerging Science at the Edge of Order and Chaos. New York: Simon and Schuster, 1992.

Wheatley, Margaret J. Leadership and the New Science. San Francisco: Berret-Koehler Publishers, 1992.

Government Documents

Department of the Army. ARTEP 7-8-MTP: Mission Training Plan for the Infantry Rifle Platoon and Squad. Washington, D.C.: Department of the Army, 30 September 1988.

-----. ARTEP 71-1-MTP: Mission Training Plan for the Tank and Mechanized Company and Company Team. Washington D.C.: Department of the Army, 3 October 1988.

-----. ARTEP 71-2-MTP: Mission Training Plan for the Tank and Mechanized Infantry Battalion Task Force. Washington D.C.: Department of the Army, 3 October 1988.

-----. FM 25-100 Training the Force. Washington, D.C.: Department of the Army, November 1988.

-----. FM 25-101 Battle Focused Training. Washington, D.C.: Department of the Army, September 1990.

-----. FM 100-5 Operations. Washington D.C.: Department of the Army, 1993.

-----. TRADOC Pam 525-5 Force XXI Operations. Fort Monroe, Virginia: Department of the Army, 1 Aug 1994.

Department of the Navy. Naval Doctrine Publication 6: Naval Command and Control. Washington D.C.: 19 May 1995.

-----. FMFM 1 Warfighting. Washington, D.C.: Department of the Navy, 6 March 1989.

Monographs

Brinkley, Phillip L. The Operational Commander's Will: An Intangible Element in Victory. Fort Leavenworth, KS: School of Advanced Military Studies, 16 May 1986.

Dixon, Richard J. The Mind is the Key: Preparing Tactical Leaders for Operations Other than War. Fort Leavenworth, KS: School of Advanced Military Studies, 17 Dec 1993.

Donahue, Kevin S. Developing Initiative in Junior Officers. Fort Leavenworth, KS: U.S. Army Command and General Staff School, 4 June 1993.

-----. The Anatomy of Discipline. Fort Leavenworth, KS: School of Advanced Military Studies, 17 Dec 1993.

Franklin, Charles D. Tactical Surprise: Beyond Platitudes. Fort Leavenworth, KS: School of Advanced Military Studies, 14 Dec 1987.

Hill, Randall R. Operational Initiative: What Is It and How Do We Get It?. Fort Leavenworth, KS: School of Advanced Military Studies, 7 June 1990.

Hodges, Frederick B. Training For Uncertainty. Fort Leavenworth, KS: School of Advanced Military Studies, 4 Feb 1993.

Oberst, David J. Three Kinds of Initiative: The Role of Initiative in Airland Battle Doctrine. Fort Leavenworth, KS: School of Advanced Military Studies, 15 May 1986.

Schneider, James J. The Theory of Operational Art. Theoretical Paper No. 3, 2d revision. Fort Leavenworth, KS: School of Advanced Military Studies, 1 March 1988.

Schneider, Michael W. Initiative as a Measure of Battle Command Effectiveness. Fort Leavenworth, KS: School of Advanced Military Studies, 17 Dec 1993.

Walters, G.L. The Art of War, Nonlinearity, and Coping with Uncertainty. Fort Leavenworth, KS: School of Advanced Military Studies, 6 May 1994.

Articles

Beyerchen, Alan. "Clausewitz, Nonlinearity, and the Unpredictability of War." International Security v17, no. 3 (Winter 1992/93): 59-90.

Crutchfield, James P. and J. Doyne Farmer and Norman H. Packard. "Chaos." Scientific American v255, no. 6 (December 1986): 46-57.

Czerwinski, Thomas J. "Command and Control at the Crossroads." Parameters vXXVI, no. 3 (Autumn 1996): 121-132.

Ditto, William L. and Louis M. Pecora. "Mastering Chaos." Scientific American v269, no. 2 (August 1993): 78-84.

Downing, Wayne A. "Training to Fight." Military Review vLXVI, no. 5 (May 1986): 18-27.

Dubik, James M. "On Initiative and Control." Marine Corps Gazette v77, no. 4 (April 1993): 74-81.

Hinton, Geoffrey E. and Steven J. Nowlan. "How Learning Can Guide Evolution." Complex Systems no. 1 (1987): 495-502.

Mann, Stephen R. "Chaos Theory and Strategic Thought." Parameters vXXII, no. 3 (Autumn 1992): 54-68.

Montuori, Alfonso. "Evolutionary Learning." World Futures v36 (1993): 173-194.

Nicholls, David and Todor D. Tagrev. "What does Chaos Theory Mean for Warfare?" Airpower Journal vVIII, no. 3 (Fall 1994): 48-57.

Ohle, David H. and John M. Spiszer. "Providing Coherence for Training Force XXI." Military Review vLXXVI, no. 4 (July-August 1996): 63-69.

Sullivan, Gordon R. "Delivering Decisive Victory: Improving Synchronization." Military Review vLXXII, no. 9 (September 1992): 2-11.

Wailand, Christine B. "Evolutionary Systems Management." World Futures v36 (1993): 138-157.

Initial Distribution List

1. Combined Arms Research Library
   U.S. Army Command and General Staff College
   1 Reynolds Avenue
   Fort Leavenworth, KS 66027-1352

2. Defense Technical Information Center
   Cameron Station
   Alexandria, VA 22314

3. Dr. James J. Schneider
   School of Advanced Military Studies
   1 Reynolds Avenue
   Fort Leavenworth, KS 66027-1352

4. LTC Jim Davidson
   Center for Army Tactics
   USACGSC
   1 Reynolds Avenue
   Fort Leavenworth, KS 66027-1352